IBM SATA 1.8-inch and 2.5-inch MLC Enterprise Value SSDs

IBM Redbooks Product Guide

The IBM® Enterprise Value solid-state drives (SSDs) employ cost-effective MLC NAND technology to bring an affordable and performance-driven solution for read-intensive applications. These SSDs are available as 2.5-inch form factor drives with both simple-swap and hot-swap options, as well as 1.8-inch drive options. These SSDs use a single-chip controller with a SATA interface on the system side and n-channels of Micron NAND Flash internally. Packaged in an HDD replacement enclosure, these SSDs integrate easily in existing storage infrastructures.

Figure 1 shows IBM SATA 2.5-inch MLC Enterprise Value SSD.

Figure 1. IBM SATA 2.5-inch MLC Enterprise Value SSD

Did you know

Unlike client drives, these 1.8-inch and 2.5-inch hot swap (HS) and simple swap (SS) SSDs for IBM System x® are equipped with a robust suite of enterprise features, including SMART attributes, hot-plug support, and uCode. They also leverage enterprise data path protection to verify data to and from NAND at every possible location and protect the integrity of the data. The NAND flash in these SSDs is screened and then tested specifically for enterprise customer use. Overall, these SSDs provide outstanding IOPS/watt and cost/IOPS for enterprise solutions and are an excellent choice for read-intensive applications like web serving, content delivery, and streaming video.

Providing that additional peace of mind, IBM Enterprise Value MLC SSDs are covered under IBM warranty. These drives carry a 1-year limited warranty, or when installed in an IBM System x server, these drives assume your system's base warranty.

Part number information

Table 1 lists the information for ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM 64GB SATA 1.8-inch MLC Enterprise Value SSD	49Y5834	A3AQ
IBM 64GB SATA 2.5-inch MLC HS Enterprise Value SSD	49Y5839	A3AS
IBM 64GB SATA 2.5-inch MLC SS Enterprise Value SSD	49Y5849	A3AT
IBM 128GB SATA 1.8" MLC Enterprise Value SSD	00W1222	A3TG
IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	90Y8648	A2U4
IBM 128GB SATA 2.5" MLC SS Enterprise Value SSD	90Y8668	A2UB
IBM 256GB SATA 1.8" MLC Enterprise Value SSD	00W1227	A3TH
IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	90Y8643	A2U3
IBM 256GB SATA 2.5" MLC SS Enterprise Value SSD	90Y8663	A2UC
IBM 512GB SATA 1.8-inch MLC Enterprise Value SSD	49Y5993	A3AR
IBM 512GB SATA 2.5-inch MLC HS Enterprise Value SSD	49Y5844	A3AU
IBM 512GB SATA 2.5-inch MLC SS Enterprise Value SSD	49Y5854	A3AV

The part numbers include the following items:

- One SSD without a drive tray (1.8-inch SSDs) or one SSD mounted on a 2.5-inch hot-swap drive tray (2.5-inch HS Enterprise Value SSDs) or 2.5-inch simple-swap drive tray (2.5-inch SS Enterprise Value SSDs)
- Support Flyer for SSD
- Warranty Flyer
- Important Notices Flyer

Features

- 1.8-inch and 2.5-inch industry standard form factors
- Support for a conventional disk drive bay (2.5-inch drives) or IBM eXFlash drive bay or SSD drive bay on selected IBM iDataPex®, IBM BladeCenter® and IBM Flex System™ servers (1.8-inch drives)
- SATA 6 Gbps interface
- Utilization of industry-leading 25 nm MLC
- Cost-effective MLC NAND technology with high read performance
- Enterprise Data Path Protection to ensure NAND integrity
- Endurance: up to 350 TB of total bytes written (TBW) for a 512 GB drives at 90% full disk based on predefined usage pattern (see explanation below)
- Energy-saving 2.5 - 3.5 watt power consumption per drive
- Absence of moving parts reduces potential failure points in the server
- Native command queuing support
- Self-monitoring, analysis, and reporting technology (SMART) command set

Technical specifications

Table 2 presents technical specifications for the Enterprise Value solid-state drives.

Table 2. Enterprise Value SSD technical specifications

Feature	64 GB			128 GB			256 GB			512 GB		
Part number	49Y5834	49Y5839	49Y5849	00W1222	90Y8648	90Y8668	00W1227	90Y8643	90Y8663	49Y5993	49Y5844	49Y5854
Interface	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA
Hot-swap drive	Yes§	Yes	No	Yes§	Yes	No	Yes§	Yes	No	Yes§	Yes	No
Form factor	1.8-inch	2.5-inch	2.5-inch	1.8-inch	2.5-inch	2.5-inch	1.8-inch	2.5-inch	2.5-inch	1.8-inch	2.5-inch	2.5-inch
Capacity	64 GB	64 GB	64 GB	128 GB	128 GB	128 GB	256 GB	256 GB	256 GB	512 GB	512 GB	512 GB
Endurance	36 TB	36 TB	36 TB	72 TB	72 TB	72 TB	175 TB	175 TB	175 TB	350 TB	350 TB	350 TB
IOPS read*	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
IOPS write*	7,000	7,000	7,000	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Sequential read rate†	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps	350 MBps
Sequential write rate†	100 MBps	100 MBps	100 MBps	140 MBps	140 MBps	140 MBps	140 MBps	140 MBps	140 MBps	140 MBps	140 MBps	140 MBps
Read latency	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms	0.5 ms
Write latency	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms	3.5 ms
Shock, operating	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms	1500 G/ 1.0 ms
Vibration, operating	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G	2-500Hz at 3.1 G

§ This SSD can be a hot-swap or non-hot-swap drive depending on a server in which it is installed.
* 4 KB block transfers
† 128 KB block transfers

Enterprise Value SSDs and Enterprise SSDs have similar read and write IOPS performance, but the key difference between them is their endurance (or life time) (that is, how long they can perform write operations because SSDs have a finite number of program/erase (P/E) cycles). Enterprise Value SSDs have a better cost/IOPS ratio but lower endurance compared to Enterprise SSDs. SSD write endurance is typically measured by the number of program/erase (P/E) cycles, that the drive incurs over its lifetime, listed as TBW in the device specification.

The TBW value assigned to a solid-state device is the total bytes of written data (based on the number of P/E cycles) that a drive can be guaranteed to complete (% of remaining P/E cycles = % of remaining TBW). Reaching this limit does not cause the drive to immediately fail. It simply denotes the maximum number of writes that can be guaranteed. A solid-state device will not fail upon reaching the specified TBW. At some point based on manufacturing variance margin, after surpassing the TBW value, the drive will reach the end-of-life point, at which the drive will go into a read-only mode. Because of such behavior by Enterprise Value solid-state drives, careful planning must be done to use them only in read-intensive environments to ensure that the TBW of the drive will not be exceeded prior to the required life expectancy.

The endurance of Enterprise Value drives is specified based on the following access pattern: 50% random data and 50% sequential data with block size mixes of 5% of the data as 4 KB block size, 5% of the data as 8 KB block size, 10% of the data as 16 KB block size, 35% of the data as 64 KB block size, and 35% of the data as 128 KB block size. The Enterprise Value drives described here are capable of 36 TB (64 GB SSD) or 72 TB (128 GB, 256 GB and 512 GB SSDs) of lifetime writes, with the workload stated above as the worse case. For the device to last in five years inside of the 72 TB of TBW, the drive write workload must be limited to no more than 40 GB of writes per day. For the device to last in three years, the drive write workload must be limited to no more than 65 GB of writes per day.

Supported servers

The solid-state drives can be installed in the System x and iDataPlex servers identified in Table 3 and the BladeCenter and Flex System servers identified in Table 4.

Table 3. Supported System x and iDataPlex servers (Part 1)

Part number	Product description	x3200 M3 (7327, 7328)	x3250 M3 (4251, 4252)	x3400 M3 (7378, 7379)	x3500 M3 (7380)	x3550 M3 (7944)	x3620 M3 (7376)	x3630 M3 (7377)	x3650 M3 (7945)	x3755 M3 (7164)	dx360 M3 (6391)
49Y5834	IBM 64GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	N	N	N	N	N	N	N	N
49Y5839	IBM 64GB SATA 2.5-inch MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	N	Y	Y	N	Y
49Y5849	IBM 64GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	N	N	N	Y	N	N	N	N	Y
00W1222	IBM 128GB SATA 1.8" MLC Enterprise Value SSD	N	N	N	N	N	N	N	N	N	N
90Y8648	IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	N	Y	Y	N	Y
90Y8668	IBM 128GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	Y	N	N	N	N	Y
00W1227	IBM 256GB SATA 1.8" MLC Enterprise Value SSD	N	N	N	N	N	N	N	N	N	N
90Y8643	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	N	Y	Y	N	Y
90Y8663	IBM 256GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	Y	N	N	N	N	Y
49Y5993	IBM 512GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	N	N	N	N	N	N	N	N
49Y5844	IBM 512GB SATA 2.5-inch MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	N	Y	Y	N	Y
49Y5854	IBM 512GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	N	N	N	Y	N	N	N	N	Y

Table 3. Supported System x and iDataPlex servers (Part 2)

Part number	Product description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383)	x3530 M4 (7160)	x3550 M4 (7914)	x3630 M4 (7158)	x3650 M4 (7915)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5 (7143)	dx360 M4 (7912)
49Y5834	IBM 64GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	N	N	N	N	N	Y	Y	Y	Y	N
49Y5839	IBM 64GB SATA 2.5-inch MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y5849	IBM 64GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y
00W1222	IBM 128GB SATA 1.8" MLC Enterprise Value SSD	N	N	N	N	N	N	N	Y	Y	Y	Y	N
90Y8648	IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
90Y8668	IBM 128GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	Y	Y	N	Y	N	N	N	Y
00W1227	IBM 256GB SATA 1.8" MLC Enterprise Value SSD	N	N	N	N	N	N	N	Y	Y	Y	Y	N
90Y8643	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
90Y8663	IBM 256GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	Y	Y	N	Y	N	N	N	Y
49Y5993	IBM 512GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	N	N	N	N	N	Y	Y	Y	Y	N
49Y5844	IBM 512GB SATA 2.5-inch MLC HS Enterprise Value SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y5854	IBM 512GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y

Table 4. Supported BladeCenter and Flex System servers

Part number	Product description	HS12 (8028)	HS22 (7870)	HS22V (7871)	HS23 (7875)	HS23E (8038)	HX5 (7873)	x220 (7906)	x240 (8737)	x440 (7917)
49Y5834	IBM 64GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	Y	N	N	N	N	N	N
49Y5839	IBM 64GB SATA 2.5-inch MLC HS Enterprise Value SSD	N	Y	N	Y	Y	N	Y	Y	Y
49Y5849	IBM 64GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	N	N	N	N	N	N	N	N
00W1222	IBM 128GB SATA 1.8" MLC Enterprise Value SSD	N	N	Y	N	N	N	N	N	N
90Y8648	IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	N	Y	N	Y	Y	N	Y	Y	Y
90Y8668	IBM 128GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	N	N	N	N	N
00W1227	IBM 256GB SATA 1.8" MLC Enterprise Value SSD	N	N	Y	N	N	N	N	N	N
90Y8643	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	N	Y	N	Y	Y	N	Y	Y	Y
90Y8663	IBM 256GB SATA 2.5" MLC SS Enterprise Value SSD	N	N	N	N	N	N	N	N	N
49Y5993	IBM 512GB SATA 1.8-inch MLC Enterprise Value SSD	N	N	Y	N	N	N	N	N	N
49Y5844	IBM 512GB SATA 2.5-inch MLC HS Enterprise Value SSD	N	Y	N	Y	Y	N	Y	Y	Y
49Y5854	IBM 512GB SATA 2.5-inch MLC SS Enterprise Value SSD	N	N	N	N	N	N	N	N	N

See the IBM ServerProven® website for the latest compatibility information for System x, BladeCenter, iDataPlex and Flex System servers: http://ibm.com/servers/eserver/serverproven/compat/us/

Supported storage controllers

The IBM SATA MLC Enterprise Value SSDs require a supported disk controller. Table 5 lists the System x controllers that support these solid-state drives installed in a supported server. Table 6 lists the BladeCenter and Flex System controllers that support these solid-state drives installed in a supported server.

Table 5. RAID controllers for System x and iDataPlex servers supported with internal SSDs (Part 1)

Part number	Product description	x3200 M3 (7327, 7328)	x3250 M3 (4251, 4252)	x3400 M3 (7378, 7379)	x3500 M3 (7380)	x3550 M3 (7944)	x3620 M3 (7376)	x3630 M3 (7377)	x3650 M3 (7945)	x3755 M3 (7164)	dx360 M3 (6391)
81Y4492	ServeRAID H1110 SAS/SATA Controller	Y	Y	Y	Y	Y	N	N	Y	N	N
90Y4304	ServeRAID M5016 SAS/SATA Controller	N	N	N	N	Y	N	N	Y	N	N
46M0829	ServeRAID M5015 SAS/SATA Controller	Y	Y	Y	Y	Y	N	Y	Y	N	Y
46M0916	ServeRAID M5014 SAS/SATA Controller	Y	Y	Y	Y	Y	N	Y	Y	N	Y
46M0831	ServeRAID M1015 SAS/SATA Controller	Y	Y	Y	Y	Y	N	Y	Y	N	Y
46M0969	ServeRAID B5015 SSD Controller	N	N	N	N	Y	N	N	Y	N	N
49Y4731	ServeRAID-BR10il SAS/SATA Controller v2	N	N	N	N	Y	N	N	Y	N	N
46M0912	IBM 6Gb Performance Optimized HBA	Y	Y	Y	Y	Y	N	Y	Y	N	Y

Table 5. RAID controllers for System x and iDataPlex servers supported with internal SSDs (Part 2)

Part number	Product description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383)	x3530 M4 (7160)	x3550 M4 (7914)	x3630 M4 (7158)	x3650 M4 (7915)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5 (7143)	dx360 M4 (7912)
Onboard	ServeRAID M5110e SAS/SATA Controller	N	N	N	N	N	N	N	Y	N	Y	N	N
81Y4481	ServeRAID M5110 SAS/SATA Controller	N	N	Y	Y	Y	Y	N	Y	N	Y	N	Y
81Y4448	ServeRAID M1115 SAS/SATA Controller	N	N	Y	Y	Y	Y	N	N	N	Y	N	Y
81Y4492	ServeRAID H1110 SAS/SATA Controller	Y	Y	Y	N	Y	Y	N	N	N	N	N	Y
90Y4304	ServeRAID M5016 SAS/SATA Controller	N	N	N	N	N	N	N	N	Y	N	Y	N
46M0829	ServeRAID M5015 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	Y	N	Y	N
46M0916	ServeRAID M5014 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	Y	N	Y	N
46M0831	ServeRAID M1015 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	N	N	N	N
46M0969	ServeRAID B5015 SSD Controller	N	N	N	N	N	N	N	N	Y	N	Y	N
Onboard	ServeRAID C105	N	N	N	N	N	N	N	N	N	N	N	N
Onboard	ServeRAID C100	N	N	N	N	N	N	N	N	N	N	N	N
46M0912	IBM 6Gb Performance Optimized HBA	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y

Table 6. RAID controllers for BladeCenter and Flex System servers supported with internal SSDs

Part number	Product description	HS12 (8028)	HS22 (7870)	HS22V (7871)	HS23 (7875)	HS23E (8038)	HX5 (7873)	x220 (7906)	x240 (8737)	x440 (7917)
90Y4390	ServeRAID M5115 SAS/SATA Controller	N	N	N	N	N	N	Y	Y	Y
90Y4750	ServeRAID H1135 Controller	N	N	N	N	Y	N	Y	N	N
Onboard	ServeRAID C105	N	N	N	N	N	N	N	N	N
Onboard	Integrated LSI SAS2004	N	N	N	Y	N	N	N	Y	Y
46C7167	ServeRAID-MR10ie (CIOv) Controller	N	N	N	N	N	N	N	N	N
Onboard	Integrated LSI SAS1064e	N	Y	Y	N	N	N	N	N	N
46M6908	SSD Expansion Card for IBM BladeCenter HX5	N	N	N	N	N	Y	N	N	N

See the IBM ServerProven website for the latest information about the adapters supported by each System x server type: http://ibm.com/servers/eserver/serverproven/compat/us/

Supported operating systems

Solid-state drives operate transparently to users, storage systems, applications, databases, and operating systems. The controllers that support SSDs are supported by the following operating systems:

- Microsoft Windows Server 2003, Web Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter x64 Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise x64 Edition
- Microsoft Windows Server 2003/2003 R2, Standard Edition
- Microsoft Windows Server 2003/2003 R2, Standard x64 Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Premium Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Standard Edition
- Microsoft Windows Server 2008 Foundation
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Datacenter x86 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Enterprise x86 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Standard x86 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008, Web x86 Edition
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012
- Red Hat Enterprise Linux 4 AS for AMD64/EM64T
- Red Hat Enterprise Linux 4 AS for x86
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server Edition with Xen
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for x86
- SUSE LINUX Enterprise Server 10 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- VMware ESX 4.0
- VMware ESX 4.1
- VMware ESXi 4.0
- VMware ESXi 4.1
- VMware vSphere 5

See the IBM ServerProven website for the latest information about the specific versions and service packs supported: http://ibm.com/servers/eserver/serverproven/compat/us/. Click **System x servers**, then **Disk controllers** to see the support matrix. Click the check mark that is associated with the System x server in question to see the details of the operating system support.

Warranty

There is a 1-year, customer-replaceable unit (CRU) limited warranty. When installed on a System x server, these drives assume your system's base warranty and any IBM ServicePac® upgrade.

Physical specifications

The IBM 2.5-inch MLC HS and SS Enterprise Value SSDs have the following physical specifications.

Dimensions and weight (approximate):

- Height: 7 mm (0.3 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 73 g (0.2 lb)

Shipping dimensions and weight (approximate):

- Height: 63 mm (2.5 in.)
- Width: 174 mm (6.85 in.)
- Depth: 133 mm (5.2 in.)
- Weight: 440 g (1.0 lb)

The IBM 1.8-inch MLC Enterprise Value SSDs have the following physical specifications.

Dimensions and weight (approximate):

- Height: 5 mm (0.2 in.)
- Width: 54 mm (2.1 in.)
- Depth: 79 mm (3.1 in.)
- Weight: 45 g (0.1 lb)

Shipping dimensions and weight (approximate):

- Height: 32 mm (1.3 in.)
- Width: 226 mm (8.9 in.)
- Depth: 150 mm (5.9 in.)
- Weight: 400 g (0.9 lb)

Operating environment

The IBM MLC Enterprise Value SSDs are supported in the following environment:

- Temperature: 0 - 70 °C (32 - 158°F) at 0 - 914 m (0 - 3,000 ft)
- Relative humidity: 8 - 85% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)

Agency approvals

The drives have the following agency approvals:

- UL
- CSA
- TUV
- CE Mark
- C-Tick Mark
- IEC
- Taiwan (BSMI Certification)
- Korea EMI
- EMC
- FCC
- VCCI

Related publications

For more information see the following documents:

- IBM US Announcement Letter for 128 GB and 256 GB 1.8-inch SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-228
- IBM US Announcement Letter for 128 GB and 256 GB 2.5-inch SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-013
- IBM US Announcement Letter for 64 GB and 512 GB 1.8-inch and 2.5-inch SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-125
- IBM Redbooks® ServeRAID Adapter Quick Reference
  http://www.redbooks.ibm.com/abstracts/tips0054.html
- *IBM System x Configuration and Options Guide*
  http://www.ibm.com/systems/xbc/cog/

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